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ABSTRACT

Although earnings generally increased in rural areas in the 1990s, Hispanic population growth led to lower wages for at least one segment of the rural population--workers with a high school degree (skilled workers), particularly men in this skill group. Using data from the Bureau of Economic Analysis and the Current Population Survey, this report examines the effects of Hispanic population growth on rural wages by gender, ethnicity, occupation, and educational attainment. The analysis combines approaches from earlier immigration-impact studies and more recent work that incorporates the role of labor demand in the labor market. Results indicate that increases in labor demand favored skilled workers (those with a high school degree) overall but favored unskilled and professional workers in some rural industries. Thus, the increased supply of unskilled labor from Hispanic immigration and population growth led to lower wages for skilled men as a result of production changes in some parts of the rural economy. Eleven data tables detail changes in nonmetro total and Hispanic population by state, 1990-2000; economic statistics for nonmetro population by ethnicity and education level; nonmetro employment by occupation, industry, and ethnicity; determinants of individual wages for different populations; determinants of relative state wages by gender and education level; and other statistical data. (Contains 22 references) (Author/SV)

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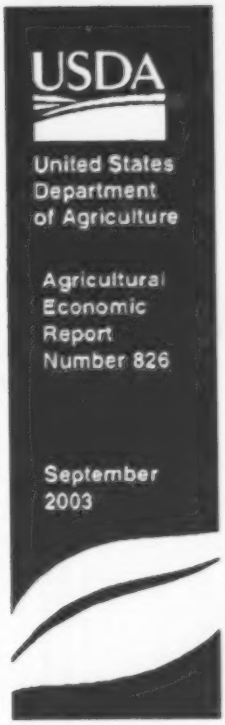

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Impacts of Hispanic Population Growth on Rural Wages

Constance Newman

Abstract

Although earnings generally increased in rural areas in the 1990s, Hispanic population growth led to lower wages for at least one segment of the rural population—workers with a high school degree (skilled workers), particularly men in this skill group. Using data from the Bureau of Economic Analysis and the Current Population Survey, this report examines the effects of Hispanic population growth on rural wages. The analysis combines approaches from earlier immigration-impact studies and more recent work that incorporates the role of labor demand in the labor market. The analysis finds that labor demand shift factors and other area-specific factors that often are not included in immigration studies are important. Results indicate that labor demand increases favored skilled workers (those with a high school degree) overall but favored unskilled and professional workers in some rural industries. Thus, the increased supply of unskilled labor from Hispanic population growth led to lower wages for skilled men as a result of production changes in some parts of the rural economy.

Keywords: Immigration, wages, labor demand, and Hispanic population growth

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Summary

Although earnings generally increased in rural areas in the 1990s, Hispanic population growth led to lower wages for at least one segment of the rural population—workers with a high school degree (skilled workers), particularly men in this skill group. This report examines the implications of Hispanic population growth for rural wages by skill group. Results suggest that forces of technological (and/or organizational) change in some rural industries led employers to demand more unskilled and professional workers relative to skilled workers, and rural Hispanic immigrants filled the new labor demand for unskilled workers. General output growth in most rural industries, however, favored skilled workers, so their earnings increased overall.

New census data show that the number of Hispanics in nonmetro counties grew 70.4 percent from 1990 to 2000, whereas the number of Whites (non-Hispanic) grew 8.6 percent. Very little is known about the economic effect of the population growth of Hispanics in rural areas, but the rapid change has led to social tensions in some areas and questions about the effects on rural wages.

Using data from the Bureau of Economic Analysis (BEA) and the Current Population Survey (CPS), this technical report examines the effects of Hispanic population growth on rural wages. The analysis combines approaches from earlier immigration-impact studies and more recent work that incorporates the role of labor demand in the labor market. A wage regression analysis is conducted and estimated changes in the structure of labor markets over the decade are broken down for a better understanding of change in labor demand by skill level. The analysis is based on the 1993 Office of Management and Budget definition of metropolitan and nonmetropolitan status. The terms "rural" and "nonmetropolitan" are used interchangeably in this report.

Traditional analyses of the economic effects of immigrants have focused on labor supply and have assumed a minimal role for labor demand and other area-specific factors. This study measures the effects of changes in labor demand and labor supply (implied by the share of Hispanics), together with other area-specific factors, on rural State-level wages. The analysis is carried out in two stages using CPS data. First, individual wages are estimated for different subpopulations (divided by gender, race, and education group) using human capital, occupation, State dummies, and other variables. Second, the estimated coefficients for the State dummies are used to estimate the effects of labor demand, the share of Hispanics, and other variables on State wage changes during 1990-2000.

Results show that labor demand shifts are important determinants of wage changes for some groups in the population and that the share of Hispanics in an area is linked to lower wages for some groups. We divided the population into three skill groups based on education: unskilled, those who have less than a high school degree; skilled, those with a high school degree; and professional, those with a college degree. Wages of skilled rural men increased with labor demand and declined with Hispanic population growth. Wages of unskilled rural men rose with increases in manufacturing and service sector labor demand but fell with labor demand in other sectors. And the wages of unskilled men were not affected by Hispanic population growth. Wages of rural women of all skill levels were affected by labor demand in some industries but not negatively affected by the share of Hispanics. Wages for professional men and women often rose with Hispanic population growth.

Using a recently developed method of decomposing changes in the structure of labor demand, the study finds evidence that helps explain the wage effects. The analysis decomposes changes in the labor market into changes in the total value of output produced across industries (output mix) and changes in the labor skill-mix used within industries (which is assumed to be a result of technological change). Results show that output-mix changes led to large increases in demand for skilled workers and that the effects of the output-mix changes were larger than the technology change effects. However, the smaller technology changes led to relative increases in demand for unskilled and professional workers, which helps explain the negative effect of immigration on skilled wages in some parts of the economy. While the findings do not reflect on the efficiency of changes in labor demand structure, they demonstrate the importance of including labor demand factors in an analysis of immigration and wage effects.

Impacts of Hispanic Population Growth on Rural Wages

Constance Newman

Introduction

The tremendous growth of the Hispanic population in rural America presents new opportunities as well as challenges for rural communities that seek to revitalize their economies. New census data show that the number of Hispanics in nonmetro counties grew 70.4 percent from 1990 to 2000, whereas the number of Whites (non-Hispanic) grew 8.6 percent. The population growth of Hispanics in rural areas is widespread, with rates over 200 percent in many Southern and Midwestern States (table 1). The data show that nonmetro Hispanics tend to have larger families and to be significantly younger than nonmetro Whites—two demographic characteristics that some consider beneficial for economic growth. The analysis is based on the 1993 Office of Management and Budget definition of metropolitan and nonmetropolitan status. The terms, "rural" and "nonmetropolitan" are used interchangeably in this report.

Very little is known about the economic impacts of the population growth of Hispanics in rural areas. Most of the information is limited to specific regional studies, which show that Hispanics have had a huge impact on the labor force, such as in the meatpacking and poultry and carpet manufacturing industries. On one hand, their presence is valued in small communities: Many local governments have actively recruited Hispanics to move to their towns. Iowa recently awarded grants of $50,000 to three counties to attract immigrants, and as a Chamber of Commerce official from one of those communities put it: "Economic development is about attracting people" (*Rural Migration News*, 2002). On the other hand, rapid demographic change in many of these communities has led to significant social tension over issues of crime, public service needs, and basic cultural differences. Other concerns include the potentially negative effect that Hispanic migration may be having on unskilled worker wages (Kandel and Parrado, 2002; Massey, Durand, and Malone, 2002).

This report focuses on the impact of Hispanic population growth on rural wages, although its effect on wage is only one part of the overall economic impact. For example, population growth can affect income, government spending, and tax revenues. This analysis looks at the effect of Hispanic population growth on the wages of rural workers by workers' education levels and gender while controlling for other economic factors. In addition, the analysis separates the impact of labor demand on wages from the impacts of labor supply, which Hispanic population growth represents. Studies on the economics of immigration often ignore the impact of changes in labor demand as a factor that can affect wages independently of immigration. This study combines approaches from the immigration literature and recent work that incorporates the role of labor demand in the market.

Table 1—Change in nonmetro total and Hispanic population by State, 1990 and 2000

State	Nonmetro population			Nonmetro Hispanic population			Share Hispanic	
	1990	2000	Change	1990	2000	Change	1990	2000
	———Number———		Percent	———Number———		Percent	---Percent---	
All States[1]	50,886,468	56,159,326	10	1,864,283	3,175,953	70	4	6
Alabama	1,330,857	1,453,233	9	5,198	26,155	403	0	2
Alaska	319,320	366,649	15	8,469	11,053	31	3	3
Arizona	559,476	719,952	29	96,006	133,073	39	17	18
Arkansas	1,310,724	1,434,529	9	9,559	36,504	282	1	3
California	961,303	1,121,254	17	177,669	275,669	55	18	25
Colorado	608,053	809,860	33	79,135	126,052	59	13	16
Connecticut	276,617	291,284	5	6,052	11,631	92	2	4
Delaware	113,229	156,638	38	1,221	6,915	466	1	4
Florida	914,571	1,144,881	25	40,822	95,689	134	4	8
Georgia	2,126,654	2,519,789	18	26,270	124,296	373	1	5
Hawaii	271,998	335,381	23	24,062	28,970	20	9	9
Idaho	710,898	861,608	21	34,508	63,768	85	5	7
Illinois	1,856,803	1,877,585	1	21,820	38,857	78	1	2
Indiana	1,581,713	1,690,582	7	12,260	36,921	201	1	2
Iowa	1,576,857	1,600,191	1	11,807	35,611	202	1	2
Kansas	1,144,646	1,167,355	2	42,458	86,016	103	4	7
Kentucky	1,905,535	2,068,667	9	8,479	24,465	189	0	1
Louisiana	1,060,433	1,098,766	4	14,915	17,505	17	1	2
Maine	732,933	760,599	4	4,002	4,964	24	1	1
Maryland	342,581	385,446	13	2,995	6,958	132	1	2
Massachusetts	87,743	96,042	9	886	1,792	102	1	2
Michigan	1,597,654	1,768,978	11	18,362	33,510	82	1	2
Minnesota	1,364,205	1,456,119	7	11,283	34,860	209	1	2
Mississippi	1,797,542	1,932,670	8	7,774	24,321	213	0	1
Missouri	1,626,202	1,800,410	11	10,822	27,807	157	1	2
Montana	607,903	692,486	14	7,658	11,344	48	1	2
Nebraska	791,050	811,425	3	16,641	44,564	168	2	5
Nevada	187,926	250,521	33	17,113	32,813	92	9	13
New Hampshire	423,101	465,353	10	2,439	3,854	58	1	1
New Mexico	673,385	783,991	16	232,457	292,788	26	35	37
New York	1,475,170	1,503,399	2	29,358	44,795	53	2	3
North Carolina	2,252,775	2,612,257	16	16,714	98,846	491	1	4
North Dakota	381,412	358,234	-6	2,472	4,277	73	1	1
Ohio	2,021,046	2,139,364	6	22,744	32,947	45	1	2
Oklahoma	1,275,743	1,352,292	6	28,400	54,881	93	2	4
Oregon	857,597	997,186	16	33,852	67,924	101	4	7
Pennsylvania	1,798,645	1,889,525	5	11,004	27,403	149	1	1
Rhode Island	87,194	85,433	-2	1,723	2,409	40	2	3
South Carolina	1,064,088	1,205,050	13	5,830	27,853	378	1	2
South Dakota	475,425	493,867	4	2,809	5,206	85	1	1
Tennessee	1,579,336	1,842,679	17	7,119	32,737	360	0	2
Texas	2,820,852	3,159,940	12	649,539	859,880	32	23	27
Utah	387,033	530,719	37	13,917	31,168	124	4	6
Vermont	385,699	409,938	6	2,361	3,644	54	1	1
Virginia	1,407,096	1,550,447	10	8,136	28,258	247	1	2
Washington	830,311	994,967	20	43,672	99,973	129	5	10
West Virginia	1,045,317	1,042,776	0	4,713	6,619	40	0	1
Wisconsin	1,560,597	1,723,367	10	11,098	28,893	160	1	2
Wyoming	319,220	345,642	8	15,680	19,515	24	5	6

[1]New Jersey and the District of Columbia do not appear because they have no nonmetro areas.

Source: Kandel (2002), using data from the U.S. Bureau of the Census.

Background

Much of the impact of Hispanic growth on rural labor markets can be seen as a type of immigration impact, in which migrants—whether from within the U.S. or from abroad—increase labor supply. Studies have focused on immigrants' impacts on the wages and employment of native-born workers (Borjas, 1999, 1997; Friedberg and Hunt, 1995). Because the addition of immigrants to a community implies a shift in labor supply, the main question has been: Have immigrants affected the labor market outcomes of natives? In a simple model with a closed economy, if immigrant labor were a substitute for native labor supply, then the wages and employment of natives would be expected to decline. But if immigrants were to provide a complementary labor supply (such as if native labor were skilled and immigrant labor were nonskilled), then native wages and employment would be expected to increase. Employers would be expected to gain from the influx of immigrants, whether the immigrants provide complementary labor or not.

Empirical studies traditionally compared immigration impacts across regions (usually metropolitan areas). This approach was criticized, however, because it assumed implicitly that immigration could affect wages in a given area but did not assume that local wages could also draw immigrants to the area—the opposite direction of causality. This method proved especially problematic because areas with high immigration empirically tended to have higher median wages, suggesting that immigrants had a positive effect on wages. Another problem with this approach was that inflows of immigrants might lead to outflows of natives, neutralizing the increase in labor supply caused by immigration. Attempts to correct for these problems in past analyses have included the use of instrumental variables and the use of natural experiments when available. Increasingly, researchers have used individual-level data, which make it possible to control for worker characteristics that may lead to immigration as well as for area-specific features that may attract workers.

Most of the results from individual-level analyses show that the impact of immigration on U.S. wages has been negligible (Borjas, 1999; Card, 1990, 2001). These studies typically include metropolitan dummy variables to control for area-specific conditions or estimate wages using fixed-effects models. Easton (2001) argues that models using geographic fixed effects have failed to account for area-specific factors that happen to be correlated with immigration. Rather than measuring changes in labor market outcomes by skill level within cities as is done in a fixed effects approach, he examines changes in wages across areas and includes three important area-specific wage determinants: inflation rates, prior wage estimates, and labor demand shifts. Different costs of living could drive wages, and shifts in industry structure could lead independently to wage increases in the same areas where immigration is high. Easton is the only author in the immigration literature that we are aware of who has incorporated these impacts, though many authors cite their importance.

Easton finds inflation and prior wages to be important determinants of wages, but he does not find strong evidence of labor demand effects. The labor demand coefficient was significant for 5 of 10 female subpopulations (for less-educated and Black women in particular) but not significant for male subpopulations. On the contrary, Easton points out that Bound and Holzer (2000) find evidence of labor demand effects in a study of wage determination. Easton finds that, even after controlling for other area effects, the percentage of immigrants in an area had a positive, significant effect on the wages of 11 out of 20 subpopulations and that the effect of immigrants was never negative. He concludes that, unless he ha[illegible]ed some omitted variable bias, the results suggest that general complementarities exist between native and immigrant workers.

In other analyses of wage changes in the U.S., economists have examined the role of labor demand shifts and have noted that production changes are an alternative way for the labor market to absorb immigration impacts. Hanson et al. (2002) describe two possible roles for labor demand shifts in wage changes. First, a Heckscher-Olin model of trade would predict changes in the output mix of a country as a possible response to immigration. This would entail shifts in production toward sectors that use relatively more of the new factor supply types. This model works only for an open economy, wherein production changes can be absorbed through international trade. The impacts on wages from a change in output mix would depend on the relative size of the country, the size of the immigration shock, and the initial product mix. With large enough changes in the supply of unskilled versus skilled workers and with a product mix and size that affects world prices, the effects of immigration could induce changes in both relative wages and real wages.

The second role of labor demand shifts in wage changes that Hanson et al. hypothesize is that of "technological" change. The use of the term "technological" is generic in the sense that it describes a change in the

mix of labor types demanded to produce a given product. This effect could be the result of structural change in an industry where the processes of production change because of either organizational change or the addition of new physical equipment. This effect, unlike the output-mix effect that could be induced by immigration itself, is not necessarily related to immigration (although one can also imagine scenarios where it could be related). Technological change that is exogenous to labor supply characteristics may drive employers to demand a different combination of skill-level inputs. A large body of research on U.S. wages in the 1980s finds a shift toward hiring more skilled workers at increasing real wages and explains it as being a result of technological change. Indeed, in reviewing the empirical literature on the effects of immigration in the U.S., Hanson et al. conclude that this "skill-biased technological change," as it is commonly referred to, has been a chief reason that immigration has not led to a significant decline in wages.

Recent work on rural employment trends suggests that changes in the industrial sector and their implications for skill-level demand shifts are important. McGranahan and Ghelfi (1998) found that most rural job growth in the 1980s was for low-skill labor but that this trend weakened in the early 1990s. They found that rural trends became more similar to urban trends from 1989 to 1995 and that rural job growth increased with education levels. Earnings for rural college graduates (expressed as a percentage of national average earnings) were relatively stable in this period, but the earnings for younger workers in this group rose rapidly. Earnings for rural high school graduates and those with some college rose somewhat; again, the increase was greater for younger workers. Earnings declined for both older and younger urban workers in this middle education group. The earnings of rural unskilled workers (those with less than a high school education) for all ages rose in rural areas but fell in urban areas. Overall, rural earnings were lower than urban earnings in the 1990s, but they rose faster than urban earnings at both high and low education levels.

Unlike traditional immigration studies, this study includes labor demand shift factors and other area-specific factors in the analysis of wages. Then employment changes are analyzed by skill type for a better understanding of the different ways labor demand affects wages. The study also examines changes in occupation and industry employment by gender and ethnic group at the individual level to inform the labor demand patterns. This approach of incorporating labor demand in the wage analysis and separately exploring its changes provides a more rounded understanding of wage dynamics than do traditional studies.

Conceptual Framework, Data, and Methods of Analysis

Conceptual Framework

The conceptual framework for this study is a combination of the frameworks used in the immigration-impact and labor demand literature. In the simple model where labor demand changes are not considered, the most unambiguous impact of immigration (via labor supply) is to depress the wages of unskilled native workers. However, when the simple model is expanded to one where trade is permitted, labor demand changes indirectly caused by immigration could lead to changes in the wages of other skill groups. This is the hypothesis of Hanson et al. where immigration leads to a change in a country's output mix toward a mix that reflects the lower relative costs of the type of labor represented by the immigrants. In the typical U.S. case, where the bulk of Hispanic immigrants are unskilled laborers, immigration would lead U.S. producers to switch some amount of production toward output that requires relatively more unskilled laborers. Since this argument implies a rightward shift in a relative labor supply curve (where labor is defined as the proportion of unskilled to skilled laborers) and then a rightward shift in relative labor demand, the effects on relative wages are ambiguous.

Another possibility linked to labor demand is that technological change could induce changes in labor demand independent of immigration that lead to changes in relative wages. Evidence shows that production has shifted toward the use of higher skilled workers, but no one has examined the data for rural areas alone. If some rural industry has become more specialized in low-skill work in the last decade, it may be a result of a technological change that has particularly affected that industry. This would cause a rightward shift in labor demand and thus an unambiguous increase in wages for unskilled workers compared with skilled workers. Such a change toward the use of unskilled labor to produce the same product could also be a firm's response to a different mix of available labor. In that case, both labor supply and demand would shift to the right and the relative wage impact would be ambiguous (as in the output-mix case).

This analysis tests for the impact of labor demand changes on wage changes and then decomposes labor demand changes into those due to technological or "labor-mix" change and those due to output-mix change. The decomposition is done separately for different skill groups for a better understanding of how the two types of production changes (technological and output mix) have affected relative demand for college-educated, skilled, and unskilled labor. For example, if output-mix changes lead to wage increases for unskilled workers, one could conclude that a preceding labor supply shift from immigration helped cause the change. If technological changes lead to wage increases for unskilled workers, the conclusion about the role of immigration would be more ambiguous. If, however, either kind of labor demand change leads to wage increases for skilled workers, one can more confidently conclude that immigration-induced labor supply shifts for unskilled workers did not contribute to labor demand changes. Thus, the analysis seeks to understand, first, the independent roles of immigration and labor demand in wage determination and, second, whether or not immigration factors can explain some of the labor demand changes.

Data Sources

The data used in this analysis are from the Bureau of Economic Analysis (BEA) and the Current Population Survey (CPS) for 1990 and 2000. These periods are roughly comparable by business cycle, and relatively little analysis has been done on rural labor market changes over the period of 1990 to 2000. This analysis uses CPS data to describe relative changes in wages, educational attainment, and employment patterns by ethnic group. It then uses individual-level CPS wage data for 1990 and 2000 to estimate relative State-level wages. The estimated 2000 wages are regressed on estimated labor demand shifts; cost of living changes; estimated 1990 wages; and percentage growth in the Hispanic population. CPS and BEA data are used to decompose changes in labor demand from 1990 to 2000.

The March CPS supplement data is used because they contain broader data on economic welfare and because the representation of Hispanics is more accurate (due to an oversampling of Hispanics in March for that purpose). Since the CPS samples are not very large and a sizable proportion of Hispanics was needed in the data, data from 1989 and 1991 and then separately data from 1999 and 2001 were combined. Neither the 1990 or 2000 years of CPS March data were used because the respondents are already included in the preceding and following years. The interview cycle of the CPS results in half of the households surveyed in March 1989 being resurveyed in March 1990 and the other half of those surveyed in March 1990 being resurveyed in March 1991. The matches are often imperfect because people move or cannot be found again, but to make sure that people were not counted twice, the middle years were excluded. Finally, standard errors for the CPS are based on the assumption of a random sample. Since the CPS is not conducted as a

random sample, the analysis uses a method developed by Jolliffe (2002) that corrects the standard errors by mimicking the sample design.[1]

Wage Analysis Method

This part of the analysis looks at how nonmetro wages have changed over the last 10 years. Based on the literature, one would expect less-educated groups to be more likely to see wages decrease as a result of Hispanic population growth. However, as noted previously, labor demand shifts and cost of living changes can also be important. The analysis includes these factors and looks at how labor demand shifts in different industries may have affected wages.

It is highly likely that local changes in the cost of living have influenced wages over time. To measure cost of living differences, we use changes in median rent by county from 1990 and 2000 Census data. This measure is far from ideal and may be said to be endogenous to wages, but it is considered the best available. Easton (2001) used two estimates of changes in price levels, neither of which is available for nonmetro areas (the Consumer Price Index and an index from the American Chamber of Commerce Research Association).

Positive labor demand shifts in an area are likely to attract people, thereby confounding the effects of labor supply and demand shifts on wages. Labor demand shifts are not directly observable, however, so a proxy must be found. The proxy of actual changes in employment is closest, but it is also determined by labor supply shifts. Following Bound and Holzer (2000) and Easton (2001), the analysis uses an estimate of demand that is exogenous to labor supply. Let η_k, represent actual changes in employment in State k. The estimate of η_k, which we call $\hat{\eta}_k$, is based on nationwide growth in employment by industry for all industries j (η_j) and State-specific industry shares (γ_{jk}) averaged over the decade and calculated as follows:

$$\hat{\eta}_k = \sum_j \gamma_{jk}\eta_j. \qquad (3)$$

The aggregate estimate is thus the sum of expected growth in each industry, where expected growth is measured as the product of the industry's share in the State economy and national growth in that industry. The analysis is extended by using this aggregate predicted labor demand ($\hat{\eta}_k$) in one model and using the expected growth in each industry j as separate independent variables ($\gamma_{jk}\eta_k$) in a second model.

The analysis follows the two-stage method of wage estimation originally suggested by Dickens and Katz (1987) and commonly used to avoid standard error bias. Moulton (1986) showed that combining individual- and metropolitan-level observations in one regression could lead to an underestimate of the standard errors of the coefficients. This analysis focuses on the year 2000 to measure the potential impacts of Hispanic population growth. The first stage regresses rural individual wages on individual characteristics along with dummy variables for the States in which the individual resides. We ran separate regressions for different subpopulations. The model estimated is as follows:

$$\ln(W_i) = a + X_{ij}b_j + Z_{il}c_l + S_{ik}d_k + u_i. \qquad (4)$$

Using CPS data, individual wages (W_i) are calculated from the total annual earnings for full-time employees (working 50-52 weeks) divided by the product of weeks worked and usual hours worked. We regress the log of individual wages (W_i) against several variables (represented by X_{ij}, Z, and S) where the lower case letters depict the estimated effects of the corresponding variables. The variable matrix X_{ij} includes the individual characteristics of education, age (and age-squared), gender, ethnic groups, and whether the person moved in the last year. The matrix Z contains dummies for the l major occupation groups, and the matrix S contains the dummies for the k States for which there are data (excluding the District of Columbia and New Jersey because they have no nonmetropolitan areas).

In the second stage, the first-stage estimated coefficients for the $k = 49$ State dummies are used as the dependent variable measuring relative differences in rural wages by State ($\hat{d}_k$). These relative wages are regressed on the growth rate of the Hispanic population in rural areas of the State (H_k), an estimate of the cost of living differences by State (C_k), an estimate of relative wage differences by State in 1990 ($\hat{d}_k^{90}$),[2] and changes in labor demand by State ($\hat{\eta}_k$). The model is as follows:

$$\hat{d}_k = \lambda + \hat{d}_k^{90} + \tau H_k + \theta C_k + \hat{\eta}_k\delta + \nu_k. \qquad (5)$$

[1] Jolliffe shows that this method performs better than assuming a random sample in the presence of incomplete information about the sampling parameters. He compares results from different methods in specific cases where formulas are available from CPS to calculate the correct standard errors.

[2] The estimate for 1990 relative wage differences by State is estimated from the same wage model as that used for 2000, shown in equation (3) with 1990 data.

The second model is the same but includes the separate j components of predicted industry labor demand ($\gamma_{jk}\eta_k$) instead of aggregate demand ($\tilde{\eta}_k$). The results of the estimation are described in the next section.

Sector Decomposition Method

The wage analysis provides a general estimate of the impact of labor demand on wages. One can better understand that impact by decomposing changes in labor demand according to whether they were due to increases in output or to technological shifts. As just discussed, these two kinds of labor demand shifts have different implications for the role of immigration.

Motivated by the notion that the labor market could be affected by production decisions, Hanson and Slaughter (2002) decompose changes in State employment into changes in output mix and changes in production techniques within sectors. Following their methodology, assume that there are N industries and M factors of production. In this case, 10 major industries are used, coinciding with the number of industries used in the wage analysis, and 3 factors of production—unskilled, skilled, and professional. In each State, a general equilibrium labor market is characterized as:

$$V = EO, \qquad (6)$$

where V is an $M \times 1$ vector of factor supplies; E is an $M \times N$ matrix of unit factor requirements for each factor type and industry; and O is an $N \times 1$ vector of real value-added output for each industry. Each element in E shows the units of factor m needed to produce one unit of real value-added output in industry n. In equation (6), factor supply equals factor demand. Decomposing (6) taking first differences results in:

$$\Delta V = \overline{E}\Delta O + \Delta E\overline{O}, \qquad (7)$$

where Δ represents changes from 1990 to 2000, $\overline{O}$ is the mean across 1990 and 2000 of real value added, and $\overline{E}$ is the mean across 1990 and 2000 of unit labor requirements. The first element in the decomposition of the demand side holds the unit labor requirements, or production technology, constant while allowing output to change. The second element holds output constant while allowing the production technology within industries to change.

A combination of BEA and CPS data are used to perform the estimation (see box for explanation) for each of the 49 States. All of the data elements in the decomposition analysis are strictly estimates: The CPS is a statistical sample, and the BEA value-added data are available only at the State-level—and not for the nonmetro areas alone.

Data Sources for Sector Decomposition Components

Real Value-Added Output

The real value-added output data at the State level for 1990 and 2000 were obtained from the U.S. Department of Commerce, Bureau of Economic Analysis (BEA). These data are available by industry and State, but not by metro/nonmetro distinction. The data are available at: www.bea.gov/bea/regional/gsp/

State Labor Supplies by Education Category

The estimates for State employment levels for skilled and unskilled groups were obtained by combining Current Population Survey (CPS) education and industry of employment data with BEA State-level employment data. The CPS data were used to first calculate the proportions of individuals of each skill type by industry and by State. These proportions were then used to apportion the BEA State-level employment data to skilled and unskilled categories by industry.

Unit Labor Requirements

The unit labor requirements were calculated from a combination of BEA and CPS data. From the CPS data, we first calculate the share of each skill group in total employment by industry and State. The unit labor requirements are then estimated by the ratio of employment by State, industry, and skill group to value added by State and industry.

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Empirical Results

Nonmetro Employment Changes by Occupation, Industry, and Ethnicity

This section first reviews basic labor market trends shown in both the BEA and the CPS data. These trends inform the wage analysis and decomposition results by showing from an individual-level perspective where different kinds of workers have moved and how their wages have changed over the last decade. The results from these descriptive statistics and the two types of analysis combine to provide a good understanding of how Hispanic migrants have affected rural wages.

Using CPS data to look at trends by ethnic group during 1990-2000, we see that Whites earned substantially more total personal income in both periods than did Blacks or Hispanics, and their gain over time was larger (table 2). Blacks earned the least of the three, but they had the highest percentage increase in income over the decade. Hispanics had the second highest increase. Wages show a similar pattern. Wages also increased with the level of education. Wage growth was highest for college-educated workers and second highest for high school graduates.

Education indicators improved for both Whites and Blacks over the decade, but show no change or just slight improvement for Hispanics. The percentage of rural Hispanics with less than a high school education was 49 percent in both years, which is much higher than for Whites at 17 percent and Blacks at 36 percent by 2000. A high proportion of immigrants and language barriers could explain the low formal education levels of Hispanics.

Rural occupation trends between 1990 and 2000 improved most for Blacks, showed some pointed changes for Hispanics, and changed little for Whites (table 3). The share of Blacks rose from 8 percent to 11 percent in professional and executive positions and from 37 percent to 43 percent in service occupations, such as sales and administrative support. The share of Blacks in blue-collar jobs dropped from 48 percent in 1990 to 41 percent in 2000. The share of Whites rose from 19 percent to 23 percent in professional jobs and fell from 33 percent to 31 percent in blue-collar jobs. The share of Whites in service-sector jobs stayed the same, at 40 percent, in both years.

The biggest change for Hispanics was a rapid movement away from farm labor (table 4). The share of Hispanics doing farm work dropped by 5 percentage points, from 14 to 9 percent. The next largest occupation drop was less than 1 percent. The share of Hispanics rose from 35 percent to 38 percent in white-collar jobs and from 39 percent to 41 percent in blue-collar jobs. The share of Hispanics in professional occupations stayed about the same.

Occupation trends show where different groups may fall within the income ranges of rural areas, while industry employment trends illustrate how different groups were affected by growth in different parts of the economy. Hispanics left agriculture at a rapid rate (6 percent), more rapidly than Blacks and Whites combined (see table 3). Blacks showed a large movement out of nondurable goods manufacturing (7 percent) and Whites a smaller movement out (2 percent), while Hispanics showed strong movement into that industry (4 percent). Overall, the three industries where all three groups had the largest presence were manufacturing, retail, and professional services.

Wage Analysis Results

Next, the relative wage regression estimates for different subpopulations are examined. In the first stage, the determinants of individual wages were estimated as depicted in equation (4). Different regressions were run for each gender and race and for three categories of educational attainment: (1) less than a high school education, or "unskilled," (2) a high school education and/or some college, or "skilled," and (3) a college degree, or "professional." The schooling categories were also combined separately with race and gender categories.[3] Table 5 shows the results of two regressions—Whites and skilled people for the year 2000—and table 6 shows a summary of the R-squared, number of observations, and significant t-statistics of the other regression groups. The results of these regressions are typical of individual wage analysis results: Age has an increasing and diminishing effect, education has a positive effect, female gender and minority race have strong negative effects, and the State wage coefficients follow typical regional patterns.

Estimates of State-level wages were obtained for each subgroup for each period, 1990 and 2000. The 1990 estimates were used as independent variables, and the 2000 estimates were used as the dependent variables in the year 2000 State-level regressions. The results of the State-level wage regressions for subgroups are shown in

[3] The estimates for Blacks were hampered by the fact that there were not enough Blacks in several States to yield State-level wage estimates; only 36 States had enough observations. This small number of observations was even more of a problem once we split the sample by gender and skill level. So the results for Blacks are not presented.

tables 7 and 8.[4] The regressions were weighted by State nonmetro population in 2000. Note the strong correlation between the estimate we use for exogenous labor demand changes ($\hat{\eta}_k$) and actual employment changes by State (η_k). A simple regression shows this result (with the standard error of the estimated coefficient in parentheses):

$$\eta_k = -0.54 + 123.\hat{\eta}_k \qquad R^2 = 0.845$$
$$(0.077)$$

The high R^2 suggests that actual labor demand at the State level closely followed that of the national level since the estimate of labor demand is based on national trends.

The results show many interesting patterns. First, it is clear that including an estimate for the State's rural wage in 1990 is important. For most subgroups, the coefficient estimate on prior wages is highly significant, suggesting that rural wage levels and their differences across States were fairly persistent over time. Second, the percentage growth of Hispanics shows a negative impact on rural wages for skilled workers and for skilled males, but it is insignificant for the other two skill groups. This negative impact on the rural wages of skilled males and skilled workers (of both genders) was found in the two versions of the model, where labor demand is aggregated and where it is separated by industry.

[4]The results for the White subgroup regressions (such as White with college degree) have been left out of the tables because they are virtually the same as the general subgroups reported.

Table 2—Economic statistics for nonmetro population by ethnicity and education level, 1989-2001

Item	1989-91			1999-2001		
	White	Black	Hispanic	White	Black	Hispanic
Mean:						
Total personal earnings	16,036	10,967	11,728	23,897	17,869	18,415
Change—						
Dollars	NA	NA	NA	7,861	6,902	6,687
Percent	NA	NA	NA	.49	.63	.57
Hourly wage	9.22	6.80	7.02	13.49	10.52	10.44
Change—						
Dollars	NA	NA	NA	4.27	3.72	3.42
Percent	NA	NA	NA	.46	.55	.49
Highest grade of education (>18 years old)	12.29	10.83	10.47	12.56	11.30	10.36
Percent attending high school (<=24 years old)	.10	.10	.09	.12	.13	.11
Percent attending college (<=24 years old)	.07	.04	.03	.07	.05	.03
Percent with less than high school education (>18 years old)	.23	.43	.49	.17	.36	.49
Percent moved since last year	14.42	14.99	26.01	11.95	13.78	17.50
	1989-91			1999-01		
	Less than high school	High school/ some college	College	Less than high school	High school/ some college	College
Mean	7.00	8.73	12.99	9.53	12.50	19.43
Standard error	.09	.05	.13	.28	.13	.44
Number of observations	7,494	26,728	7,255	2,419	10,111	2,738
Level of change	NA	NA	NA	2.53	3.77	6.44
Percent change	NA	NA	NA	.36	.43	.50

NA = Not applicable.
Sources: March Current Population Survey, 1989, 1991, 1999, and 2001.

These results are important in light of the common expectation that Hispanic population growth would have the most impact on the unskilled or those with less than a high school education. But the results are not inconsistent with the theory that wages could be affected by changes in labor demand toward more or less skilled labor. Alternately, the results could reflect a situation where skilled workers are working in jobs that require lesser skills. The result brings to mind the replacement of White and Black males in higher paying jobs by less-educated Hispanics that occurred in the meat-processing industry.[5]

[5]See MacDonald, Ollinger, Nelson, and Handy (2000) for an analysis of consolidation in U.S. meatpacking and accompanying wage trends.

Table 3—Nonmetro employment by occupation, industry, and ethnicity, 1990-2000

Job types	1990			2000			Change		
	White	Black	Hispanic	White	Black	Hispanic	White	Black	Hispanic
	Percent						*Percentage point*		
By major occupation group:									
Executive, administrative, and managerial	8.97	2.66	4.28	10.93	4.08	4.71	1.96	1.42	.43
Professional specialty	10.29	5.45	4.81	11.94	6.73	4.25	1.65	1.28	-.56
Total	19.26	8.11	9.09	22.87	10.81	8.96	3.61	2.70	-.13
Technicians and related support	2.31	1.72	.71	2.78	2.23	1.00	.47	.51	.29
Sales	10.98	5.17	7.78	10.85	7.87	9.36	-.13	2.70	1.58
Administrative support, including clerical	12.80	6.36	8.74	12.75	9.28	8.53	-.05	2.92	-.21
Private household	.92	3.02	1.21	.51	1.16	.93	-.41	-1.86	-.28
Protective service	1.54	1.75	.89	1.73	2.94	1.89	.19	1.19	1.00
Service, except household and protective	11.83	18.89	15.62	11.80	19.67	16.57	-.03	.78	.95
Total	40.38	36.91	34.95	40.42	43.15	38.28	.04	6.24	3.33
Farming, forestry, and fishing	7.46	6.33	15.98	5.75	3.62	10.84	-1.71	-2.71	-5.14
Precision production: craft, and repair	12.96	9.98	14.11	12.96	11.58	14.35	0	1.60	.24
Machine operators, assemblers, and inspectors	9.23	19.85	11.73	7.58	14.41	10.86	-1.65	-5.44	-.87
Transportation and material moving	5.44	6.78	5.29	5.28	6.28	5.98	-.16	-.50	.69
Handlers, equipment cleaners, helpers, and laborers	4.97	11.15	8.18	4.78	9.04	10.21	-.19	-2.11	2.03
Total	32.6	47.76	39.31	3.6	41.31	41.40	-2.00	-6.45	2.09
By major industry group:									
Agriculture, forestry, and fisheries	7.30	5.22	16.97	5.70	3.01	10.60	-1.60	-2.21	-6.37
Mining	1.40	.43	2.01	1.07	.40	1.58	-.33	-.03	-.43
Construction	7.09	5.96	6.54	8.02	4.75	7.23	.93	-1.21	.69
Durable goods manufacturing	11.09	12.16	7.28	10.99	13.85	7.01	-.10	1.69	-.27
Nondurable goods manufacturing	8.47	2.56	12.08	6.71	14.00	15.80	-1.76	-6.56	3.72
Transportation, communications, and public utilities	5.84	4.56	3.78	5.93	5.27	4.56	.09	.71	.78
Wholesale trade	3.29	1.73	3.25	3.40	2.72	4.95	.11	.99	1.70
Retail trade	17.86	14.54	16.45	17.45	16.98	17.69	-.41	2.44	1.24
Finance, insurance, and real estate	4.20	1.49	1.67	4.15	1.58	2.22	-.05	.09	.55
Business and repair services	3.81	2.61	3.16	4.37	4.40	3.28	.56	1.79	.12
Personal services, including private households	4.37	6.80	6.22	3.29	4.15	4.14	-1.08	-2.65	-2.08
Entertainment and recreation services	.95	.61	1.09	1.52	.43	.76	.57	-.18	-.33
Professional and related services	19.73	18.83	14.84	22.35	22.00	15.66	2.62	3.17	.82
Public administration	4.59	4.50	4.67	5.06	6.46	4.52	.47	1.96	-.15

Sources: March Current Population Survey, 1989, 1991, 1999, and 2001.

The results also show that labor demand factors are important determinants of wages, especially in the first two skill-level categories. Growth in aggregate demand for labor reduced unskilled wages, increased skilled wages, but did nothing for college wages. For males, females, and Whites as separate groups with combined education levels, labor demand factors had no significant effect.[6] But when these groups were broken down by education level, demand mattered, and aggregate labor

[6]All impacts reported are statistically significant unless otherwise noted. This study reports significant results up to 10 percent significance since there are relatively few observations (48) in the State-level regressions and thus low statistical power. Different levels of significance are noted in table 8.

Table 4—Nonmetro Hispanic employment by occupation, 1990 and 2000

Occupation	1990	2000	Change
		Percent	
Farm workers and related	14.15	9.02	-5.13
Other professional specialty	1.61	.78	-.83
Personal service	3.16	2.36	-.80
Construction trades	4.66	3.94	-.72
Financial records, processing	1.47	.77	-.70
Machine operators and tenders, except precision	7.09	6.56	-.53
Health service	2.73	2.29	-.44
Sales workers, retail and personal services	5.69	5.28	-.41
Freight, stock and material handlers	3.03	2.69	-.34
Mail and message distributing	.58	.29	-.29
Food service	6.69	6.45	-.24
Other executive, administrators, and managers	3.11	2.92	-.19
Private household service	1.05	.87	-.18
Engineers	.27	.10	-.17
Computer equipment operators	.27	.11	-.16
Health diagnosing	.30	.15	-.15
Engineering and science technicians	.26	.13	-.13
Supervisors—administrative support	.38	.26	-.12
Teachers, except college and university	1.68	1.61	-.07
Teachers, college and university	.31	.26	-.05
Technicians, except health engineering	.09	.08	-.01
Other transportation and material moving	2.22	2.22	0
Natural scientists	.05	.07	.02
Health technologists and technicians	.60	.62	.02
Mechanics and repairers	3.55	3.58	.03
Forestry and fishing	.35	.40	.05
Farm operators and managers	.46	.52	.06
Management related	.77	.97	.20
Construction laborer	1.51	1.71	.20
Motor vehicle operators	3.46	3.80	.34
Sales representatives, finance, and business service	.44	.78	.34
Secretaries, stenographers, and typists	1.42	1.79	.37
Fabricators, assemblers, inspectors, and samplers	4.56	4.96	.40
Administrators and officials, public administration	.27	.69	.42
Sales representatives, commodities, except retail	.51	1.06	.55
Health assessment and treating	.43	1.03	.60
Supervisors and proprietors, sales	2.00	2.60	.60
Protective service	.67	1.57	.90
Other administrative support	4.08	5.31	1.23
Other precision production	5.73	7.22	1.49
Cleaning and building service	4.08	5.66	1.58
Other handlers, equipment cleaners, and laborers	4.17	6.34	2.17

Sources: March Current Population Survey, 1989, 1991, 1999, and 2001.

Table 5—Determinants of individual wages for different populations, 2000

Independent variables	High school graduates			Whites		
	Coefficient	Standard error	t-Statistic	Coefficient	Standard error	t-Statistic
Age	0.05	0	13.13	0.04	0	12.77
Age-squared	0	0	-10.48	0	0	-9.60
Highest grade level achieved	.06	.01	7.24	.05	0	12.39
Female	-.28	.02	-17.04	-.27	.02	-17.63
Race/ethnic groups:						
Black	-.09	.03	-3.24	NA	NA	NA
Asian, Pacific Islander	.16	.10	1.59	NA	NA	NA
Native American	-.09	.06	-1.48	NA	NA	NA
Hispanic	-.03	.03	-.79	NA	NA	NA
Moved in the last year	-.05	.02	-2.37	-.04	.02	-1.92
Occupations:[1]						
Professional	0	.04	.10	0	.03	.02
Technical	.06	.04	1.50	0	.04	-.01
Sales	-.24	.03	-7.27	-.30	.03	-10.02
Adminstrative support	-.16	.03	-5.57	-.24	.03	-8.81
Private household	-.74	.16	-4.48	-.89	.12	-7.34
Protective service	-.08	.05	-1.70	-.18	.05	-3.85
Service (all other)	-.47	.03	-14.83	-.52	.03	-17.76
Farming, Forestry	-.39	.05	-7.40	-.49	.04	-10.88
Precision production	-.08	.03	-2.49	-.16	.03	-5.69
Machine operators	-.09	.03	-2.95	-.17	.03	-5.86
Transportation	-.19	.04	-5.04	-.23	.04	-6.47
Handlers, laborers	-.35	.04	-8.69	-.39	.04	-10.34
Civilian military	-.23	.08	-2.74	-.25	.08	-3.14
States:[2]						
New Hampshire	.15	.06	2.59	.09	.05	1.99
Vermont	.01	.05	.11	.02	.04	.58
Massachusetts	.11	.08	1.39	.12	.06	1.90
Rhode Island	.26	.06	4.08	.28	.08	3.68
Connecticut	.24	.10	2.36	.22	.09	2.44
New York	.10	.05	1.91	.08	.05	1.83
Pennsylvania	.06	.05	1.08	.04	.05	.85
Ohio	.12	.06	2.17	.12	.05	2.55
Indiana	.02	.05	.47	-.01	.04	-.14
Illinois	.07	.06	1.25	.06	.05	1.38
Michigan	0	.07	-.06	.02	.06	.43
Wisconsin	.05	.05	.88	.02	.05	.35
Minnesota	0	.06	0	.06	.05	1.17
Iowa	.05	.05	.99	.04	.04	.85
Missouri	.10	.07	1.45	.01	.06	.24
North Dakota	-.07	.05	-1.20	-.08	.05	-1.70
South Dakota	-.04	.06	-.68	-.03	.05	-.57
Nebraska	-.05	.05	-1.03	-.07	.04	-1.75
Kansas	.03	.05	.64	.03	.04	.73
Delaware	.12	.08	1.65	.05	.06	.84
Maryland	.04	.08	.49	.07	.08	.90
Virginia	.12	.06	1.82	.11	.06	1.81
West Virginia	-.12	.05	-2.34	-.09	.04	-2.19
North Carolina	.10	.05	1.98	.05	.05	1.03

See notes at end of table.

Continued—

Table 5—Determinants of individual wages for different populations, 2000—Continued

Independent variables	High school graduates			Whites		
	Coefficient	Standard error	t-Statistic	Coefficient	Standard error	t-Statistic
South Carolina	0.07	0.06	1.15	0.06	0.06	1.01
Georgia	.09	.06	1.63	.07	.05	1.44
Florida	-.06	.07	-.88	-.09	.07	-1.34
Kentucky	.02	.05	.37	.03	.04	.68
Tennessee	-.03	.06	-.52	-.01	.05	-.15
Alabama	.01	.06	.18	0	.05	.08
Mississippi	-.01	.05	-.23	.07	.05	1.51
Arkansas	-.03	.05	-.63	-.04	.04	-.91
Louisiana	-.11	.06	-1.69	-.07	.06	-1.26
Oklahoma	-.05	.06	-.84	-.07	.05	-1.46
Texas	-.05	.05	-.99	-.05	.04	-1.26
Montana	-.03	.05	-.65	-.03	.04	-.70
Idaho	.01	.05	.21	.02	.04	.39
Wyoming	.04	.05	.85	.05	.04	1.26
Colorado	.09	.07	1.28	.09	.05	1.63
New Mexico	-.19	.06	-3.27	-.10	.07	-1.53
Arizona	-.01	.08	-.09	.01	.08	.15
Utah	.09	.08	1.17	.07	.05	1.29
Nevada	.09	.09	.92	.15	.08	1.82
Washington	.10	.06	1.74	.07	.05	1.26
Oregon	.12	.06	1.99	.13	.05	2.58
California	-.03	.12	-.22	.03	.10	.32
Alaska	.31	.06	5.27	.24	.05	4.45
Hawaii	-.08	.10	-.77	-.02	.11	-.23
Constant	-.88	.35	-2.49	-.13	.16	-.82
R-squared	.2172			.2665		
Number of observations	10,111			12,964		

NA = Not applicable.
[1]The occupation group that was excluded is "Executive, administration, and managerial."
[2]The State that was excluded from the regression is Maine.
Sources: March Current Population Survey, 1989, 1991, 1999, and 2001.

Table 6—Summary of results from individual wage regressions for different populations

Item	Whites	Males	Female	Less than high school	High school/ some college	College
R-squared	0.2665	0.2587	0.2397	0.2384	0.2172	0.1884
Number of observations	12,964	8,057	7,211	2,419	10,111	2,738
Significant t-statistics	22 of 67	18 of 70	17 of 70	17 of 71	25 of 71	20 of 71

	Less than high school		College		High school/ some college	
	Female	Male	Female	Male	Female	Male
R-squared	0.1816	0.2710	0.2070	0.2074	0.1659	0.1912
Number of observations	981	1,438	1,319	1,419	4,911	5,200
Significant t-statistics	10 of 69	18 of 70	20 of 70	20 of 69	16 of 70	14 of 69

Sources: March Current Population Survey, 1989, 1991, 1999, and 2001.

Table 7—Determinants of relative State wages by gender and education level

Item	Whites	Males	Females	Less than high school	High school/ some college	College
Estimated wage, 1990	**0.76**	**0.68**	**0.65**	0.25	**0.72**	**0.46**
	(5.21)***	**(4.91)*****	**(4.02)*****	(1.03)	**(4.18)*****	**(2.08)****
Aggregate labor demand	.02	0	0	**-.01**	**.003**	-.002
	(1.19)	(.65)	(.99)	**(-1.93)***	**(1.79)***	(-.62)
Percent change median rent	**.31**	**.30**	.24	-.04	**.27**	.29
	(2.55)**	**(2.36)****	(1.50)	(-.15)	**(1.82)***	(1.11)
Percent Hispanic, 2000	-.22	**-.26**	-.15	.08	**-.38**	.14
	(-2.26)**	**(-2.41)****	(-1.16)	(.35)	**(-3.11)*****	(.61)
Constant	-.05	-.06	-.01	.17	-.05	-.09
	(-1.06)	(-1.28)	(-.16)	(1.60)	(-.81)	(-.91)
Number of observations	48	48	48	48	48	48
Adjusted R-squared	.415	.396	.257	.112	.330	.040
Estimated wage, 1990	**.94**	**.69**	**.87**	.18	**1.11**	.30
	(5.18)***	**(3.62)*****	**(5.03)*****	(.64)	**(5.44)*****	(1.06)
Agriculture	-.15	-.08	-.06	.05	-.33	.46
	(-.89)	(-.34)	(-.31)	(.13)	(-1.62)	(1.17)
Agricultural services, mining	**.12**	-.01	**.18**	-.15	**.23**	-.11
	(2.27)**	(.13)	**(3.49)*****	(-1.37)	**(3.68)*****	(-.97)
Construction	.03	-.15	.04	-.19	.13	-.14
	(.43)	(-.15)	(.49)	(-1.04)	(1.47)	(-.77)
Manufacturing	-.03	.77	-.78	**2.68**	-.88	1.09
	(-.06)	(1.25)	(1.37)	**(2.29)****	(-1.51)	(.84)
Transportation, utilities	-.06	-.05	-.15	-.51	-.03	-.27
	(-.37)	(-.26)	(-.78)	(-1.24)	(-.17)	(-.68)
Wholesale trade	-.32	-.18	-.33	-.46	-.51	.37
	(-1.06)	(-.47)	(-1.02)	(-.66)	(-1.42)	(.52)
Retail trade	-.06	-.12	.01	**-.43**	.07	-.06
	(-.71)	(-1.07)	(.12)	**(-1.94)***	(.65)	(-.27)
Finance, real estate	.13	.04	**.23**	-.19	**.19**	-.11
	(1.48)	(.41)	**(2.27)****	(-.90)	**(1.93)***	(-.53)
Services	.02	.05	-.01	**.28**	-.06	.13
	(.41)	(.92)	(-.19)	**(2.53)****	(-1.19)	(1.15)
Government	.41	0	.06	.05	.09	-.14
	(.81)	(.01)	(1.12)	(.41)	(1.56)	(-1.15)
Percent change median rent	**.33**	**.29**	.26	.10	**.27**	.19
	(2.33)**	**(1.89)***	(1.54)	(.34)	**(1.73)***	(.60)
Percent Hispanic, 2000	-.16	-.23	-.08	.09	**-.28**	.44
	(-1.08)	(-1.28)	(-.48)	(.26)	**(-1.72)***	(1.19)
Constant	-.07	-.07	-.03	.07	-.06	-.14
	(-1.20)	(-1.09)	(-.54)	(.59)	(-.87)	(-1.19)
Number of observations	48	48	48	48	48	48
Adjusted R-squared	.436	.299	.463	.130	.480	.041

Numbers in bold = 10 percent or greater significance. *10 percent significance. **5 percent significance. ***1 percent significance.
Numbers in parentheses = t-statistics.
Sources: March Current Population Survey, 1989, 1991, 1999, 2001, and Bureau of Economic Analysis, 1990 and 2000.

Table 8—Determinants of relative State wages by combined gender and education levels

Item	Less than high school		College		High school/ some college	
	Female	Male	Female	Male	Female	Male
Estimated wage, 1990	**0.66**	0.18	0.03	**0.86**	**0.58**	**0.62**
	(2.92)* **	(.79)	(.14)	**(3.76)*** **	**(2.94)*** **	**(3.70)*** **
Aggregate labor demand	0	**-.01**	-.003	-.001	.002	**.004**
	(-.02)	**(-2.11)** **	(-.54)	(-.33)	(.75)	**(2.00)***
Percent change median rent	-.07	.07	-.54	**.91**	.28	.16
	(-.24)	(.22)	(-1.36)	**(2.98)*** **	(1.44)	(.96)
Percent Hispanic, 2000	.37	.16	-.11	**.67**	-.13	**-.63**
	(1.27)	(.53)	(-.29)	**(2.38)** **	(-.83)	**(-4.24)*** **
Constant	.04	**.23**	.16	**-.31**	.00	-.06
	.30	**(1.77)***	(1.13)	**(-2.64)** **	(.02)	(.93)
Number of observations	48	48	48	48	48	48
Adjusted R-squared	.149	.069	-.010	.290	.120	.340
Estimated wage, 1990	**.74**	.21	-.18	**.73**	**.98**	**.78**
	(2.90)* **	(.80)	(-.61)	**(2.77)*** **	**(5.04)*** **	**(3.22)*** **
Agriculture	.27	-.24	-.04	.68	-.17	-.19
	(.57)	(-.44)	(-.08)	(1.46)	(-.86)	(-.59)
Agricultural services, mining	**-.25**	-.06	**.26**	**-.35**	**.26**	.11
	(-1.96)*	(-.39)	**(1.73)***	**(-2.62)** **	**(4.30)*** **	(1.20)
Construction	-.31	-.07	.02	-.12	.16	.07
	(-1.41)	(-.29)	(.07)	(-.55)	(1.72)	(.56)
Manufacturing	2.19	**2.95**	-.38	1.35	**-1.32**	-.32
	(1.52)	**(1.84)***	(-.22)	(.92)	**(-2.12)** **	(-.39)
Transportation, utilities	-.40	-.38	.04	-.38	-.19	.07
	(-.80)	(-.69)	(.08)	(-.80)	(-.92)	(.27)
Wholesale trade	-.81	-.40	-1.59	**1.75**	-.09	-.51
	(-.96)	(-.42)	(-1.55)	**(2.13)** **	(-.25)	(-.95)
Retail trade	-.17	**-.64**	.26	-.30	.02	.10
	(-.63)	**(-2.14)** **	(.84)	(-1.18)	(.18)	(.68)
Finance, real estate	0	-.27	-.21	-.13	**.35**	.06
	(.04)	(-.92)	(-.66)	(-.55)	**(3.18)*** **	(.43)
Services	.16	**.32**	.10	.15	-.08	-.05
	(1.23)	**(2.14)** **	(.63)	(1.14)	(-1.35)	(-.65)
Government	.07	.09	-.21	-.12	.10	.04
	(.48)	(.58)	(-1.25)	(-.89)	(1.62)	(.46)
Percent change median rent	.32	.18	**-1.07**	**1.14**	**.31**	.10
	(.86)	(.47)	**(-2.26)** **	**(3.36)*** **	**(1.71)***	(.51)
Percent Hispanic, 2000	-.02	.33	.90	.37	-.07	**-.56**
	(-.04)	(.70)	(1.62)	(.90)	(-.40)	**(-2.36)** **
Constant	-.11	.15	.12	**-.37**	.002	-.05
	(-.68)	(.96)	(.73)	**(-2.69)** **	(.03)	(-.65)
Number of observations	48	48	48	48	48	48
Adjusted R-squared	.148	.022	.030	.330	.490	.240

Numbers in bold = 10 percent or greater significance. *10 percent significance. **5 percent significance. ***1 percent significance.
Numbers in parentheses = t-statistics.
Sources: March Current Population Survey, 1989, 1991, 1999, 2001, and Bureau of Economic Analysis, 1990 and 2000.

demand had strongly opposite effects. For skilled males, increased aggregate labor demand increased on wages, and for unskilled males, it reduced them. Sector differences in demand did not affect the wages of skilled males but did affect the wages of unskilled and professional males. For unskilled men, increases in manufacturing and service sector demand led to wage increases, while increases in retail trade demand led to wage decreases. For professional men, growth in the wholesale trade sector increased wages, while growth in agricultural services and mining decreased wages.

For females, the story is very different. Increased aggregate labor demand was never as significant a determinant of female wages as it was for males, but increased labor demand in certain sectors was strongly so. Growing labor demand in agricultural and financial services raised wages for all females regardless of education. These results were similar to the results for skilled women, except that skilled women's wages were lowered by growth in manufacturing labor demand. Wages for unskilled women fell from increased labor demand in agricultural services. The opposite was true for professional women. The results suggest that women's wages depended more on specific industry shifts, which is consistent with their historically higher degree of occupational segregation.

To test the robustness of the results, the four States—Alaska, Rhode Island, Connecticut, and New Mexico—with the largest estimated wage outliers were excluded and the regressions were re-run. Alaska, Rhode Island, and Connecticut had the highest wage coefficients (for Whites) and low percentages of Hispanics. New Mexico had the lowest wage coefficients and a high percentage of Hispanics. The strong negative results in some of the regressions of the percentage Hispanic variable could have been driven by the four outlier States. The results of the test indicate that the Hispanic effect was not as strong without those States, but it was still significant in the smaller model regressions for Whites, skilled workers, and male skilled workers. See tables 9 and 10 for a summary of the results.

Sector Decomposition Results

The results from the decomposition of labor demand changes over the decade of the 1990s are shown in table 11, which shows changes in the share of State employment of each skill type and their decomposition into production technology changes and output changes. In columns 1, 4, and 7 (ΔV_u for unskilled, ΔV_s for skilled, and ΔV_p for professional), we see that the share of unskilled workers increased in most States, while that of skilled workers decreased and professional workers stayed the same. The average shares of unskilled workers in both 1990 and 2000 were very low, an average 12 percent in 1990 and 15 percent in 2000. The average shares of skilled workers fell from 72 percent in 1990 to 69 percent in 2000, and the average shares of professional workers stayed at 17 percent over the decade (only the percentage changes are shown in the table).

The decomposition results show that rural trends differ markedly from the national trends found in the 1980s by Hanson and Slaughter (2002) who found clear evidence of a production technology shift toward higher skill levels. This analysis finds a bimodal effect for nonmetro areas in the 1990s: Production technology effects caused a shift away from skilled workers much faster than from unskilled and professional workers. Technological change for unskilled labor positively

Table 9—Robustness test of Hispanic effect on State relative wages by gender and education level

Models	Whites	Males	Females	Less than high school	High school/ some college	College
Small model:						
Percent Hispanic, 2000	**-0.22**	**-0.26**	-0.15	0.08	**-0.38**	0.14
Full	**(-2.26)****	**(-2.41)****	(-1.16)	(.35)	**(-3.11)*****	(.61)
Percent Hispanic, 2000	**-.22**	**-.21**	-.05	.06	**-.27**	.30
Test	**(-1.87)***	(-1.57)	(-.30)	(.20)	**(-1.79)***	(1.02)
Bigger model:						
Percent Hispanic, 2000	-.16	-.23	-.08	.09	**-.28**	.44
Full	(-1.08)	(-1.28)	(-.48)	(.26)	**(-1.72)***	(1.19)
Percent Hispanic, 2000	-.18	-.13	.14	.04	-.09	**1.42**
Test	(-.84)	(-.48)	(.56)	(.06)	(-.40)	**(2.56)****

Numbers in bold = 10 percent or greater significance. *10 percent significance. **5 percent significance. ***1 percent significance. Numbers in parentheses = t-statistics.

Sources: March Current Population Survey, 1989, 1991, 1999, and 2001.

affected 15 States and technological change for professional labor positively affected 4 States. Skilled labor had no positive shifts, and their technology shifts were much more negative on average than for the other two groups. These negative numbers could indicate that the productivity of individual workers was rising and at a faster rate than among skilled labor. Thus, the few positive and less-negative estimates of the technology change for unskilled labor indicate that a larger share of unskilled labor was required to produce the same unit value added of output. However, the analysis is unable to confirm whether this resulted from a substitution of unskilled for skilled labor in production or from faster productivity growth among skilled workers. On average, the technology effect was the least negative for unskilled labor at -0.03, while the average for skilled labor was -0.29 and -0.06 for professional labor.

Changes in employment shares due to output-mix changes show the opposite of the bimodal technology effect. The skilled group benefited most from output changes. The average across States for the change in shares due to output changes was 0.26 for skilled labor, 0.05 for unskilled labor, and 0.06 for professionals.

The results on output effects imply that rural industries shifted production toward sectors that used available labor supply types more intensively and that despite the Hispanic population growth, the relatively more abundant laborers were skilled workers. Given that the U.S. is an open economy, we can assume that many of these production changes led to changes in exports and imports as well. At the same time, production technology shifts—that is, the relative use of different skilled labor within industries—played an important role. The trend estimated here reflects change toward higher proportions of unskilled labor in some industries, although we do not know which ones. This result differs from national findings, which could mean that there are important differences between metro and nonmetro areas. Or it could reflect differences by decade, since all of the national studies have used the 1980 and 1990 Censuses. The results here suggest that rural industries generally expanded production that demanded more skilled labor but that some proportion of industries experienced technological change that led to higher demand for unskilled labor.

The greater growth in higher skill jobs found by McGranahan and Ghelfi (1998) is consistent with our finding that output growth alone led to an increased demand for skilled workers. And our finding that technology shifts led to an increased relative demand for unskilled and professional workers is consistent with McGranahan and Ghelfi's finding of higher growth in wages for rural unskilled and college-educated workers compared with their urban counterparts. McGranahan and Ghelfi characterize the rural economy as dominated by production activities: agriculture, mining, manufacturing, and production services, which include legal, financial, and accounting services. The urban economy by contrast, has a large and similarly sized production sector, but it also has a significant consumer service sector. Further analysis should test for technological changes in particular production activities driving this result.

Table 10—Robustness test of Hispanic effect on State relative wages by combined gender and education level

	Less than high school		College		High school/ some college	
Item	Female	Male	Female	Male	Female/	Male
Small model:						
Percent Hispanic, 2000	0.37	0.16	-0.11	**0.67**	-0.13	**-0.63**
Full	(1.27)	(.53)	(-.29)	**(2.38)****	(-.83)	**(-4.24)*****
Percent Hispanic, 2000	.25	.18	-.11	**.99**	.09	**-.53**
Test	(.73)	(.47)	(-.22)	**(2.89)****	.52	**(-2.71)****
Bigger model:						
Percent Hispanic, 2000	-.02	.33	.90	.37	-.07	**-.56**
Full	(-.04)	(.70)	(1.62)	(.90)	(-.40)	**(-2.36)****
Percent Hispanic, 2000	-.66	.35	**2.62**	**1.16**	.32	-.53
Test	(-1.09)	(.45)	**(2.80)****	**(1.97)***	(1.35)	(-1.50)

Numbers in bold = 10 percent or greater significance. *10 percent significance. **5 percent significance. ***1 percent significance. Numbers in parentheses = t-statistics.

Sources: March Current Population Survey, 1989, 1991, 1999, and 2001.

Table 11—Sector decomposition: Changes in share of nonmetro State employment by skill type, 1990-2000

Region/State	Unskilled (less than high school)			Skilled (high school/some college)			Professional (college)		
	(1) ΔV_u	(2) $\Delta E_u \bar{O}$	(3) $\bar{E} \Delta O_u$	(4) ΔV_s	(5) $\Delta E_s \bar{O}$	(6) $\bar{E} \Delta O_s$	(7) ΔV_c	(8) $\Delta E_c \bar{O}$	(9) $\bar{E} \Delta O_c$
New England	0	-0.03	0.03	0.02	-0.18	0.20	-0.02	-0.10	0.08
Maine	0.01	-.01	.02	0	-.14	.14	-.01	-.05	.04
New Hampshire	.01	-.05	.06	.02	-.32	.33	-.03	-.15	.12
Vermont	.02	-.03	.04	.02	-.15	.17	-.04	-.09	.05
Massachusetts	.04	.03	.01	0	-.26	.26	-.04	-.12	.09
Rhode Island	-.08	-.13	.05	.09	-.05	.15	-.01	-.12	.11
Connecticut	.02	.02	.01	0	-.14	.14	-.03	-.09	.07
Mid-Atlantic	.02	0	.02	-.03	-.22	.19	0	-.03	.03
New York	.01	-.02	.02	-.01	-.16	.15	0	-.02	.03
Pennsylvania	.04	.02	.03	-.04	-.27	.23	0	-.04	.04
East North Central	.04	.02	.03	-.05	-.30	.25	.01	-.04	.04
Ohio	.05	.03	.02	-.13	-.37	.24	.08	.04	.05
Indiana	.03	-.02	.05	0	-.25	.26	-.03	-.06	.03
Illinois	.04	.02	.02	-.04	-.27	.23	0	-.04	.04
Michigan	.08	.05	.03	-.06	-.32	.26	-.02	-.05	.03
Wisconsin	.03	0	.03	-.03	-.29	.27	0	-.06	.06
West North Central	.01	-.03	.04	-.02	-.27	.25	.01	-.03	.05
Minnesota	.02	-.05	.07	-.08	-.36	.28	.06	.01	.05
Iowa	-.02	-.07	.05	.01	-.21	.22	.01	-.02	.04
Missouri	.02	-.03	.04	-.07	-.34	.27	.06	.01	.04
North Dakota	.02	-.01	.03	-.04	-.27	.23	.02	-.03	.04
South Dakota	.02	-.01	.03	.01	-.29	.30	-.03	-.10	.07
Nebraska	.01	-.03	.04	-.01	-.25	.25	0	-.04	.04
Kansas	.01	-.02	.04	.02	-.19	.21	-.03	-.07	.04
South Mid-Atlantic	.04	.01	.03	-.07	-.28	.21	.02	-.02	.05
Delaware	.06	.01	.05	-.05	-.27	.22	-.01	-.05	.04
Maryland	.04	.01	.02	-.12	-.29	.18	.08	.03	.04
Virginia	.03	0	.03	-.04	-.29	.25	0	-.06	.06
West Virginia	.05	.01	.03	-.06	-.25	.19	.02	-.01	.03
South Atlantic	.08	-.01	.09	-.07	-.39	.32	-.01	-.07	.06
North Carolina	.10	.04	.06	-.08	-.47	.39	-.02	-.09	.07
South Carolina	.06	-.01	.06	-.06	-.34	.28	.01	-.05	.06
Georgia	.07	-.10	.18	-.07	-.41	.35	0	-.05	.04
Florida	.09	.04	.05	-.06	-.35	.29	-.03	-.08	.05
East South Central	.02	-.06	.08	0	-.27	.27	-.01	-.06	.05
Kentucky	.01	-.07	.08	-.01	-.28	.27	-.01	-.06	.05
Tennessee	0	-.10	.11	.01	-.30	.31	-.01	-.05	.04
Alabama	-.01	-.07	.06	.04	-.21	.25	-.03	-.09	.06
Mississippi	.06	-.01	.06	-.06	-.29	.23	0	-.06	.06
West South Central	.01	-.06	.07	-.01	-.23	.22	0	-.04	.04
Arkansas	.05	-.01	.06	-.04	-.34	.30	-.01	-.07	.06
Louisiana	-.02	-.06	.04	.02	-.09	.11	0	-.03	.02
Oklahoma	.01	-.04	.05	.01	-.19	.19	-.02	-.05	.04
Texas	0	-.13	.12	-.02	-.31	.29	.03	-.03	.05

See notes at end of table.

Continued—

Table 11—Sector decomposition: Changes in share of nonmetro State employment by skill type, 1990-2000—Continued

Region/State	Unskilled (less than high school)			Skilled (high school/some college)			Professional (college)		
	(1) ΔV_u	(2) $\Delta E_u \overline{O}$	(3) $\overline{E} \Delta O_u$	(4) ΔV_s	(5) $\Delta E_s \overline{O}$	(6) $\overline{E} \Delta O_s$	(7) ΔV_c	(8) $\Delta E_c \overline{O}$	(9) $\overline{E} \Delta O_c$
Mountain	0.03	-0.07	0.09	-0.02	-0.43	0.42	-0.01	-0.11	0.10
Montana	.01	-.02	.03	-.06	-.27	.22	.05	-.02	.07
Idaho	.03	-.06	.08	-.01	-.46	.45	-.01	-.09	.08
Wyoming	.02	-.03	.04	-.01	-.26	.26	-.01	-.06	.06
Colorado	-.03	-.15	.12	0	-.40	.39	.03	-.09	.12
New Mexico	.02	-.14	.16	.03	-.61	.64	-.04	-.15	.11
Arizona	.03	-.12	.14	-.06	-.51	.45	.04	-.08	.12
Utah	.06	-.04	.10	-.03	-.43	.40	-.03	-.14	.11
Nevada	.08	.01	.07	.02	-.52	.54	-.10	-.20	.11
Pacific	.05	-.03	.07	-.08	-.37	.29	.04	-.03	.07
Washington	0	-.08	.08	.02	-.24	.26	-.02	-.08	.05
Oregon	.02	-.08	.10	-.11	-.49	.38	.09	.01	.08
California	.11	.08	.04	-.15	-.39	.23	.04	-.03	.07
Hawaii, Alaska	.05	.06	-.01	-.03	-.03	0	-.02	-.02	0
Alaska	.09	.12	-.03	-.05	-.05	0	-.04	-.03	-.01
Hawaii	.01	.01	0	0	0	0	0	-.01	0
State average	.03	-.02	.05	-.03	-.29	.26	0	-.06	.06

Sources: March Current Population Survey, 1989, 1991, 1999, 2001, and Bureau of Economic Analysis data, 1990 and 2000.

Conclusions

The literature sources brought together in this report combine to provide a new framework for understanding the impacts of immigration on the rural U.S. economy. By including both labor supply and demand factors and other important area-specific determinants in the wage analysis, this analysis found not only an apparent labor supply effect from the increase in the Hispanic population, but also a labor demand effect. Other studies of immigration impact that do not include labor demand, prior wages, and estimates of the cost of living may be subject to omitted variable bias. The findings in this analysis were further enhanced by an examination of changes in occupation and industry participation at the individual level and by a decomposition of changes in industry skill-level requirements by State.

Growth in the rural Hispanic population reduced wages of skilled workers, particularly male skilled workers. This result implies a twist on the simple immigration model prediction in which increases in unskilled labor supply affect only the unskilled labor market, but it is consistent with other models in which labor demand shifts can play a role. This study found that such shifts were important. Wages for skilled workers rose in response to increases in labor demand whether at the aggregate level for men or in different industrial sectors for women.

An important caveat regarding the results is that because the regressions have relatively few observations, the probability of not finding significance, even though it exists, is high. On one hand, the effect of Hispanics or of any of the hypothesized determinants may be important to other subgroups but may not be evident in this analysis. On the other hand, finding consistently significant impacts with so few observations strengthens the value of the significant results. The significance levels decline when the four States with outlying wage estimates are excluded, but the negative relationship between the percentage of Hispanics and wages of skilled male workers is still quite evident.

The provisional sector decomposition analysis suggested possible reasons for the different impacts of Hispanic population growth and labor demand shifts on rural wages. Most employment growth favored skilled workers because it was driven by large changes in output mix, which favored skilled workers. Within some industries, however, changes in the occupational mix led to increases in demand for unskilled and, to a lesser extent, professional labor, relative to that for skilled labor. The occupational mix changes help explain the positive association with aggregate labor demand for skilled workers wages in the wage regressions: the positive association is consistent with increases in labor demand resulting from general output growth. The occupational mix changes also help explain why greater labor demand in only certain industries was associated with wage growth for unskilled and professional workers. At the same time, growth in the Hispanic labor force is negatively correlated with skilled worker's wages, consistent with a relative shift in demand toward unskilled labor within some industries.

The analysis found that Hispanics moved away from agriculture and into manufacturing and services, while Whites and Blacks moved out of manufacturing. Hispanics increased their presence in blue- and white-collar occupations, while both Blacks and Whites moved out of blue-collar jobs and into white-collar, or professional, jobs. The economic status of all three ethnic groups improved over the decade. Nevertheless, the findings in this report taken all together suggest that the increased supply of and increased relative demand for unskilled Hispanic laborers in parts of the manufacturing and service industries led to lower demand and lower wages for skilled labor in those industry subsectors. Other analyses of the rural manufacturing sector in the 1990s identified the converse, where rural manufacturers generally sought to hire workers with higher skill levels (McGranahan, 2000). This finding could suggest either that the differentiation in the skill mix across detailed manufacturing industries is greater or that increases in unskilled labor demand may be coming from service industries. The exact roots of these demand changes need to be further examined.

The increased demand for unskilled labor found in some parts of the rural economy may have been indirectly caused by the change in the labor pool available to firms resulting from Hispanic immigration, but it could also be a pure labor demand "pull" effect as postulated by Hanson et al. That relationship is ambiguous and is probably a combination of dynamic responses of supply and demand to each other. But this study shows that the impact of immigration on wages was isolated because overall employment and wage growth favored skilled workers and outweighed the effect of technology changes.

It is possible that the technological changes have led to greater efficiency and thus greater economic benefit overall, although the benefit may be going more to employers than to labor. However, we cannot conclude from this analysis whether or not the shift to more unskilled labor in some industries is more efficient. That conclusion would require a more detailed investigation, which is beyond the scope of this analysis, into the industries that are changing their labor demand and the reasons for the change.

This study has identified significant changes in rural labor markets. A deeper understanding of these changes will require more detailed study of the industry, as data become available. For example, changes in skill mix identified from the CPS sample can be confirmed by 2000 Census data. The Equal Employment Opportunity Special Tabulation of these data will provide detailed industry information by occupation educational attainment, which is needed to refine and confirm the estimates presented here. These data will help us better understand underlying production changes and the changing occupational skill requirements in contrast to the indirect skill measure provided by changes in education levels alone. Finally, the variation across States in the decomposition analysis suggests that there may be important differences in changes in skill demand across rural labor markets. Indeed, this would appear to be the key to understanding the differential effect of Hispanic population growth on rural wages.

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